Lethbridge Research Centre Report: All-female insect armies could be boon for livestock industry

Lethbridge, Alta., March 29, 2001: Tiny, beneficial wasps have caught scientists' attention because of a unique trait - they produce only female offspring when they are infected with the Wolbachia bacterium. At the Lethbridge Research Centre, scientists are hoping to use all-female wasp strains, infected with Wolbachia, to boost their biocontrol efforts against stable fly, a harmful pest of cattle.

Beneficial wasps used for biological control of flies in feedlots are nothing like the large, bothersome wasps that sting people, explains Dr. Kevin Floate, a livestock pest biological control scientist at the Centre. These beneficial wasps work because they lay eggs in the pupa of pest fly species. The wasp eggs hatch, killing the developing fly and reducing fly populations.

Wolbachia could dramatically improve the success of beneficial wasps used for biological control by eliminating male wasps from the population, Floate believes.

"When we mass produce wasps as biological control agents, about 40 percent of all wasps we produce are males. That is essentially a waste of energy because males don't lay eggs and therefore can't kill the flies," Floate says. "If we could produce a Wolbachia-infected strain of wasps, so that every wasp we produce is female, then we won't be wasting 40 percent of our efforts generating males."

Wobachia research has just started to develop around the world in the last 10-15 years, says Floate. "It's an exciting area because the bacteria are believed to infect as many as 10 percent of all known insect species. We're only beginning to learn what these Wolbachia do and what effect they have on different insects."

Studies by Dr. George Kyei-Poku, a new scientist at the Centre, are expected to benefit both producers and the Lethbridge Pest Control Program, says Floate. Kyei-Poku is an insect pathologist with a broad base of experience in different pathogens. His work at the Centre will focus on Wolbachia.

Already, Kyei-Poku has done preliminary work to show that Wolbachia can be detected in wasps using DNA techniques.

"Detection of Wolbachia is an important first step," says Kyei-Poku, "because we will be able to detect the bacteria in wasps that we collect from feedlots."

Kyei-Poku and his research team will begin collecting wasps from Alberta feedlots this summer. They are optimistic that Wolbachia will be found naturally in some species. "In previous studies, we have found some wasps species with a heavy female sex ratio, a good indication that Wolbachia are present naturally," says Floate.

Once naturally occurring Wolbachia-infested wasps are identified, further studies will be done to determine whether Wolbachia could be used as part of the overall biological control program for livestock pests.

"The ultimate goal would be to use female Wolbachia-infected strains to produce biocontrol agents for release in what we call innundative biocontrol, where repeated mass releases are done throughout the summer to control flies," Floate says.

Researchers are also investigating the potential for Wolbachia infection in controlling reproduction in pest fly species themselves, says Floate. Unlike wasps, fly species do not produce all female strains when infected with Wolbachia but the bacteria does seem to cause fly species to produce fewer offspring, which could reduce overall fly numbers on feedlots, he says.

Flies cause discomfort and stress in cattle, resulting in production losses. The painful bites of stable flies can reduce weight gain and feed conversion efficiency in feeder cattle by up to 20 percent, costing Alberta feedlot operators an estimated $7 million in lost production each year, says Floate.

The Lethbridge Research Centre has Agriculture and Agri-Food Canada's national mandate for both biocontrol of insects and beef production efficiency research.

For further information contact:
Dr. Kevin Floate,
Livestock Pest Biological Control
phone: (403) 317-2242

Dr. George Kyei-Poku
phone: (403) 317-2232

José Barbieri
Acting Communications Coordinator
phone: (403) 317-3303
Lethbridge Research Centre

phone: (403) 327-4561
fax: (403) 382-3156
Email: lethbridge@agr.gc.ca

Acknowledgment:

Communication sponsored in part by the Canada Alberta Livestock Research Trust Inc .

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Last modified: 4/11/2003

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